

Optimalizace kardiovaskulární situace



Beneš Jan

KARIM LFP UK a FN Plzeň

Konflikt zájmů:

- **Dlouhodobá výzkumná spolupráce s Edwards Lifesciences Inc., Pulsion – GETINGE, CNSystems**

- 1. Před operací**
- 2. V průběhu**
- 3. .. Po op ?**

PŘED ...

Pherson/Distributed by Universal Uclick via CartoonStock.com 8-21



“We don’t have to anesthetize patients anymore. I just walk in with this and they pass out in a second.”



ASA



MET



NSQIP





Enter Patient Information

Procedure

44970 - Laparoscopy, surgical, appendec

Begin by entering the procedure name or CPT code. Or the desired procedure to properly select it. You may use an example: "cholecystectomy + cholangiography"

Are there other potential appropriate treatment options?

Please enter as much of the information as you can. A rough estimate will still be provided.

Age Group

Under 65 years

Sex

Male

Functional Status

Independent

Emergency Case

No

ASA Class

Healthy patient

Steroid use for chronic condition

No

Ascites within 30 days prior to surgery

No

Systemic Sepsis within 48 hours prior to surgery

None

Ventilator Dependent

No

Disseminated Cancer

No



Procedure: 44970 - Laparoscopy, surgical, appendectomy
Risk Factors: Male

Change Patient Risk Factors

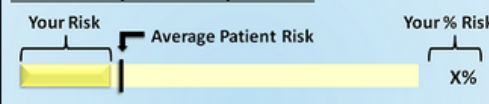
Note: Your Risk has been rounded to one decimal point.

Outcomes

Outcome	Your Risk	Average Risk	Chance of Outcome
Serious Complication	1.4%	2.7%	Below Average
Any Complication	1.8%	3.5%	Below Average
Pneumonia	0.1%	0.2%	Below Average
Cardiac Complication	0.0%	0.1%	Below Average
Surgical Site Infection	0.8%	1.3%	Below Average
Urinary Tract Infection	0.1%	0.2%	Below Average
Venous Thromboembolism	0.1%	0.2%	Below Average
Renal Failure	0.0%	0.1%	Below Average
Readmission	1.9%	3.0%	Below Average
Return to OR	0.5%	0.8%	Below Average
Death	0.0%	0.1%	Below Average
Discharge to Nursing or Rehab Facility	0.3%	0.5%	Below Average
Sepsis	0.1%	0.2%	Below Average

Predicted Length of Hospital Stay: 0.5 days

How to Interpret the Graph Above:




Surgeon Adjustment of Risks

This will need to be used infrequently, but surgeons may adjust the estimated risks if they feel the calculated risks are underestimated. This should only be done if the reason for the increased risks was NOT already entered into the risk calculator.

1 - No adjustment necessary

**Intravaskulární
náplň**



**Chronická
medikace**



Preoperative fasting does not affect haemodynamic status: a prospective, non-inferiority, echocardiography study

L. Muller^{1,3*}, M. Brière^{1,3}, S. Bastide², C. Roger^{1,3}, L. Zoric^{1,3}, G. Seni², J.-E. de La Coussaye^{1,3}, J. Ripart^{1,3} and J.-Y. Lefrant^{1,3}

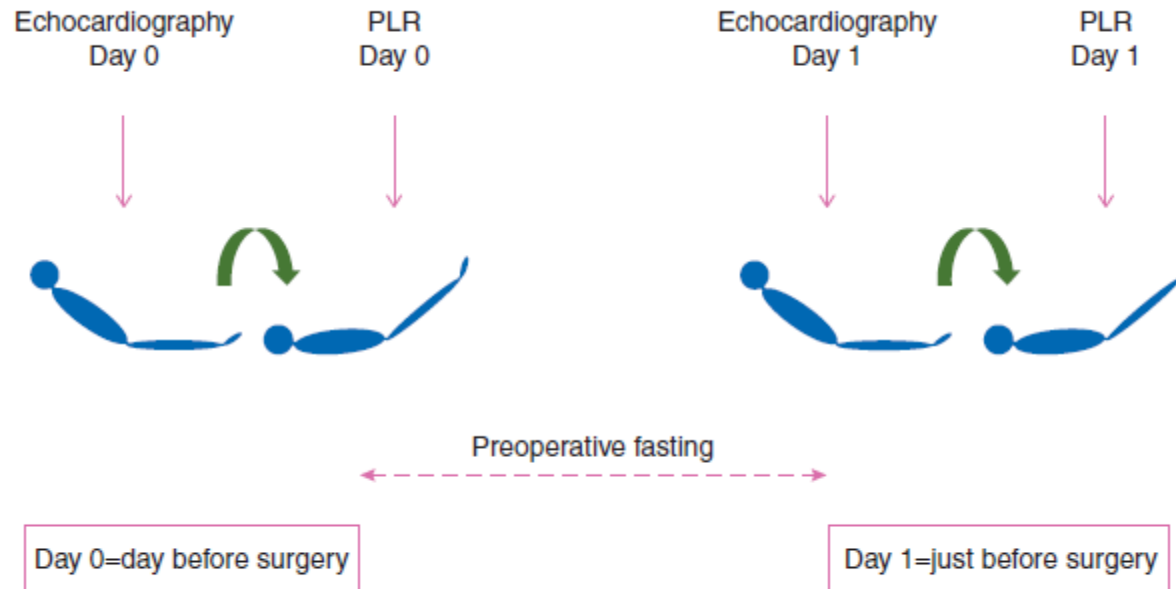


Fig 1 General design of the study: at admission (Day 0 between 17:00 and 20:00), included patients had a first echocardiography and a PLR test. The same procedure was repeated on Day 1 (between 07:00 and 08:00) after preoperative fasting, just before anaesthesia.

Preoperative fasting does not affect haemodynamic status: a prospective, non-inferiority, echocardiography study

L. Muller^{1,3*}, M. Brière^{1,3}, S. Bastide², C. Roger^{1,3}, L. Zoric^{1,3}, G. Seni², J.-E. de La Coussaye^{1,3}, J. Ripart^{1,3} and J.-Y. Lefrant^{1,3}

	Day 0	Day 1	Δ D0 D1 % (95% CI)
SAP (mm Hg)	132 (19)	125 (17)	-4.9 (-7.0 to -2.8)
DAP (mm Hg)	77 (11)	76 (10)	-1.1 (-3.3 to 1.1)
HR (bpm)	76 (11)	72 (11)	-3.9 (-6.4 to -1.3)
VTI before PLR	17.5 (2.4)	17.6 (2.6)	1.0 (-1.0 to 3.0)
Δ VTI (%)	7.9 (7.1)	6.4 (6.1)	-1.6 (-3.3 to 0.2)
Δ IVC (%)	37 (21)	33 (20)	-4.2 (-8.9 to 0.5)
E (cm s ⁻¹)	76.8 (14.4)	74.0 (14.1)	-2.9 (-5.5 to -0.4)
EDT (ms)	202 (34)	204 (32)	2.3 (-1.3 to 5.9)
E/A	1.23 (0.34)	1.22 (0.32)	1.5 (-2.7 to 5.6)
E/Ea	6.14 (1.58)	6.13 (1.58)	1.4 (-2.3 to 5.1)

Conclusion

In conclusion, the present study shows that 8 h preoperative fasting did not alter TTE dynamic and static preload indices in ASA I–III adult patients with no bowel preparation. This suggests that preoperative fasting does not induce significant hypovolaemia.

[Acta Anaesthesiol Scand](#). 2019 Oct;63(9):1129-1136. doi: 10.1111/aas.13419. Epub 2019 Jun 26.

Effect of preoperative fluid therapy on hemodynamic stability during anesthesia induction, a randomized study.

[Myrberg T](#)¹, [Lindelöf L](#)¹, [Hultin M](#)¹.

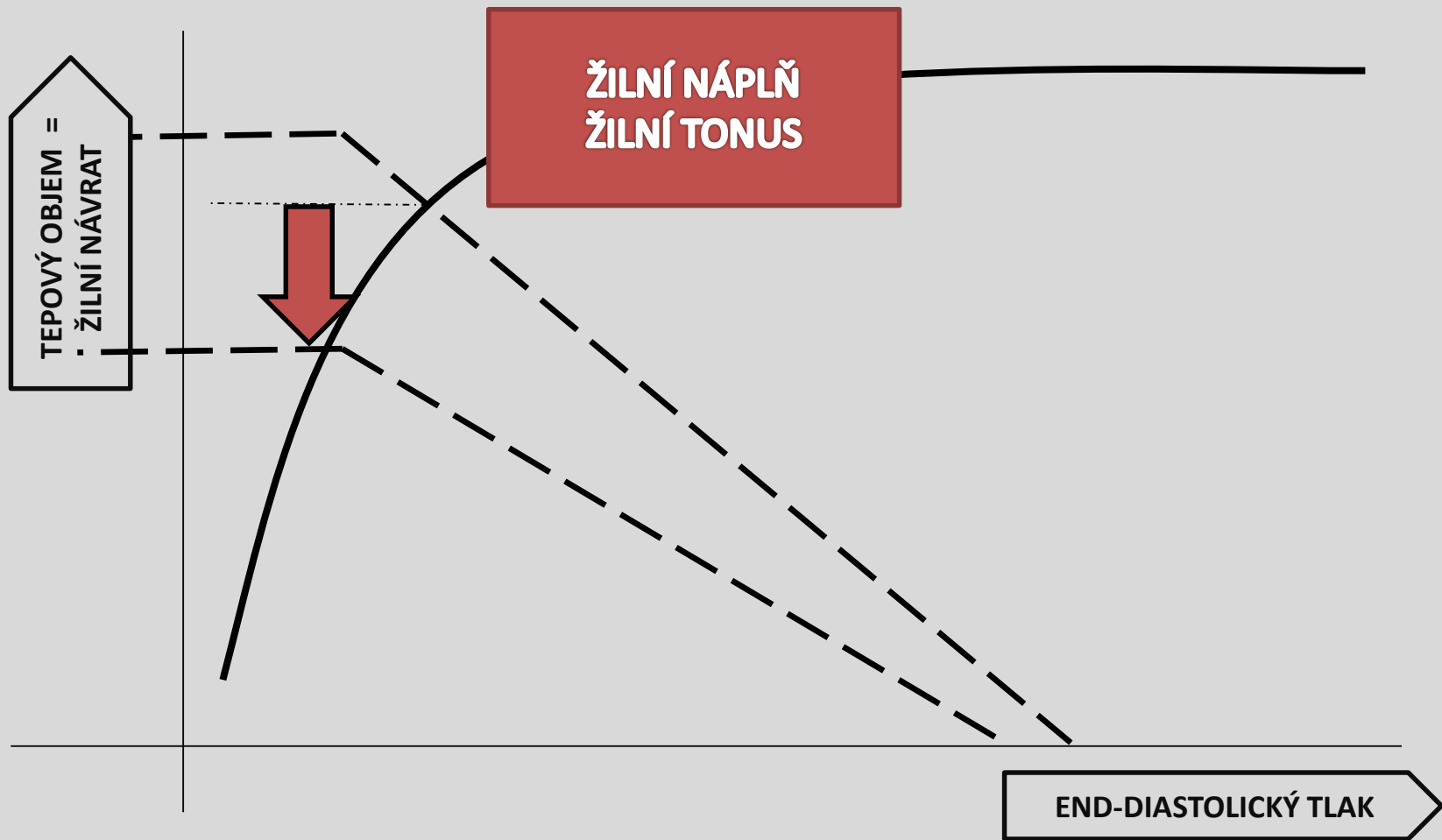
Author information

- 1 Department of Surgical and Perioperative Sciences, Anesthesiology and Intensive Care Medicine, Sunderby Research Unit, Umeå University, Umeå, Sweden.

[Acta Anaesthesiol Scand](#). 2018 Oct;62(9):1215-1222. doi: 10.1111/aas.13157. Epub 2018 May 30.

Pre-operative fluid bolus for improved haemodynamic stability during minor surgery: A prospectively randomized clinical trial.

[Kratz T](#)^{1,2}, [Hinterobermaier J](#)^{1,3}, [Timmesfeld N](#)⁴, [Kratz C](#)^{1,2}, [Wulf H](#)¹, [Steinfeldt T](#)^{1,5}, [Zoremba M](#)^{1,6}, [Aust H](#)^{1,7}.



Effect of preoperative fluid therapy on hemodynamic stability during anesthesia induction, a randomized study.

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Pre-operative fluid bolus for improved haemodynamic stability during minor surgery: A prospectively randomized clinical trial.

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ELSEVIER

Journal of Critical Care

Available online 12 September 2019

In Press, Journal Pre-proof



Co-induction with a vasopressor “chaser” to mitigate propofol-induced hypotension when intubating critically ill/frail patients—A questionable practice

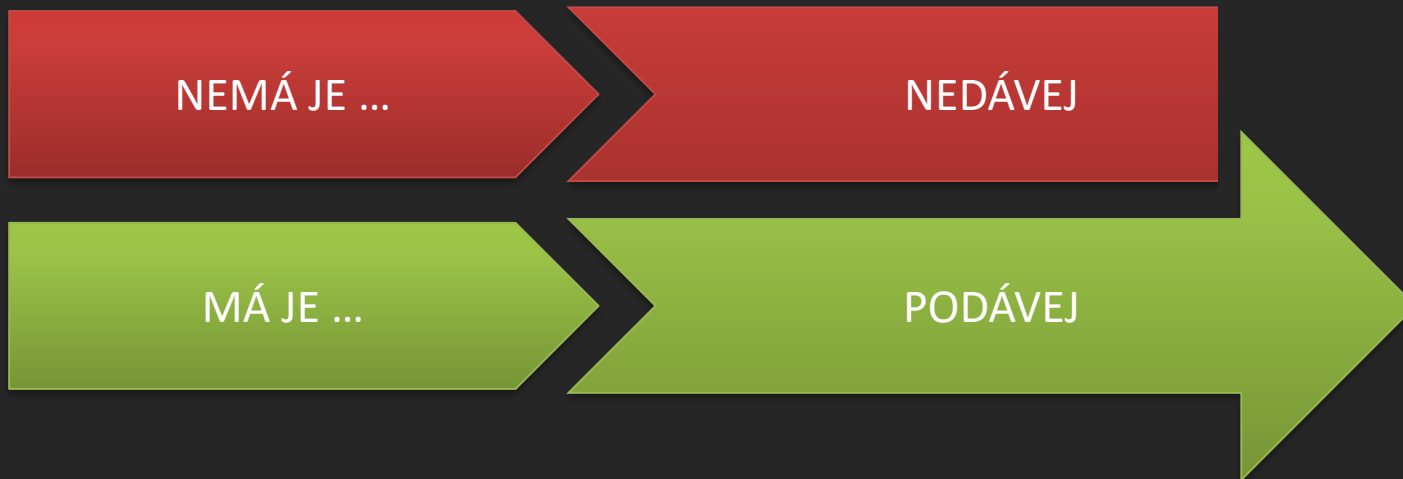
M.-H. Ho Anthony, Glenio B. Mizubuti

Perioperative beta-blockers for preventing surgery-related mortality and morbidity (Review)

Blessberger H, Kammler J, Domanovits H, Schlager O, Wildner B, Azar D, Schillinger M, Wiesbauer F, Steinwender C



In *non-cardiac surgery*, evidence shows an increase in death and a potential increase in stroke rate with the use of beta-blockers. The substantial reduction in rhythm disturbances and heart attacks in this setting seems to be offset by this potential increase in mortality and stroke. As the quality of evidence is still low to moderate, more evidence is needed before a definitive conclusion can be drawn.



January 12, 2017

Should We Withhold ACE Inhibitors Just Before Noncardiac Surgery?

Allan S. Brett, MD reviewing Roshanov PS et al. *Anesthesiology* 2017 Jan

In an observational study, withholding angiotensin-converting–enzyme inhibitors was associated with fewer adverse events.

For patients who take angiotensin-converting–enzyme (ACE) inhibitors and undergo noncardiac surgery, some observational studies suggest that continuing the ACE inhibitors on the morning of surgery is associated with excess risk for intraoperative hypotension. However, the evidence is not decisive, and the 2014 American College of Cardiology/American Heart Association guideline on management of patients undergoing noncardiac surgery concludes that continuation of ACE inhibitors or angiotensin-receptor blockers (ARBs) perioperatively “is reasonable” (*Circulation* 2014;130:e278).

Now, researchers have addressed this issue using data from a prospective cohort study of patients (age, ≥ 45) who underwent noncardiac surgery and required overnight hospital admission. Among 4802 patients who used ACE inhibitors or ARBs routinely, 74% took the drug during the 24 hours before surgery; the drug was withheld in the remaining 26%. The following outcomes were noted:

- The primary composite outcome (death, stroke, or myocardial injury defined by perioperative rise in troponin level) occurred in 12.0% of patients whose ACE inhibitor or ARB was withheld and in 12.9% of those whose drug was continued; after adjustment for potentially confounding variables (including preoperative blood pressure and use of other antihypertensive drugs), the relative risk for this outcome was significantly lower in the drug-withheld group (RR, 0.82; $P=0.01$).
- Incidence of intraoperative hypotension was lower in the drug-withheld group than in the drug-continued group (23.3% vs. 28.6%); in adjusted analyses, relative risk was significantly lower in the drug-withheld group (RR, 0.80; $P<0.001$).
- Clinical and surgical factors were not associated substantially with continuing versus withholding ACE inhibitors or ARBs; thus, most decisions to withhold the drugs likely were arbitrary and based on clinician preference.

COMMENT

This analysis doesn't carry the authority of a randomized trial, but the authors' conclusion — that we should consider withholding ACE inhibitors and ARBs before noncardiac surgery — is reasonable. They note that anesthesia-related blunting of sympathetic vascular tone might increase reliance on the renin-angiotensin system to maintain blood pressure intraoperatively.

Allan S. Brett, MD

Editor-in-Chief

NEJM JOURNAL WATCH

NEJM JOURNAL WATCH GENERAL

MEDICINE

[Biography](#) | [Disclosures](#) | [Summaries](#)

A Systematic Review of Outcomes Associated With Withholding or Continuing Angiotensin-Converting Enzyme Inhibitors and Angiotensin Receptor Blockers Before Noncardiac Surgery

Caryl Hollmann, MBChB, DA(SA), Nicole L. Fernandes, MBChB, DA(SA), and Bruce M. Bickard, MBChB, FCA, PhD

- **Findings:** The continuation of ACE-Is/ARBs on the morning of noncardiac surgery is associated with increased intraoperative hypotension; however, an association with mortality and major adverse cardiac events remains unclear.

NEMÁ JE ...

NEDÁVEJ

MÁ JE ...

ZVAŽ A SPÍŠ NEDÁVEJ

PŘI ...



Perioperative goal directed therapy – current view

Jan Zatloukal^{1,2}, Jiri Pouska^{1,2}, Jan Benes^{1,2,3}

118 STUDIÍ

14 009 PTS

Table 1 Summary of the major positive outcomes of pGDT based on the meta-analysis by Chong *et al.* (7) and studies listed in *Table 2* (mortality only)

Parameter	Number of studies [subjects]	GRADE of evidence	Relative effect	Number needed to treat
Hospital LOS	62 [8,797]	Very low	-0.90 (0.48–1.32) days	N/A
Wound infection	32 [3,593]	Low	0.48 (0.37–0.63)	19
AKI	3 [3,593]	Very low	0.72 (0.58–0.92)	29
Pneumonia	29 [2,776]	Low	0.69 (0.52–0.92)	38
Mortality [Chong <i>et al.</i> (7)]	52 [5,550]	Low	0.66 (0.50–0.87)	59
Mortality (<i>Table 2</i>)	94 [12,113]	N/A	0.80 (0.71–0.90)	56

pGDT, perioperative goal directed therapy; AKI, acute kidney injury; CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development and Evaluation; LOS, length of stay; N/A, not available.

Mortalita: OR 0,8, NNT - 56

Morbidita*:

Pneumonie – OR 0.69 NNT – 38

AKI – 0.72 NNT – 29

Infekce rány - 0.48 NNT – 19

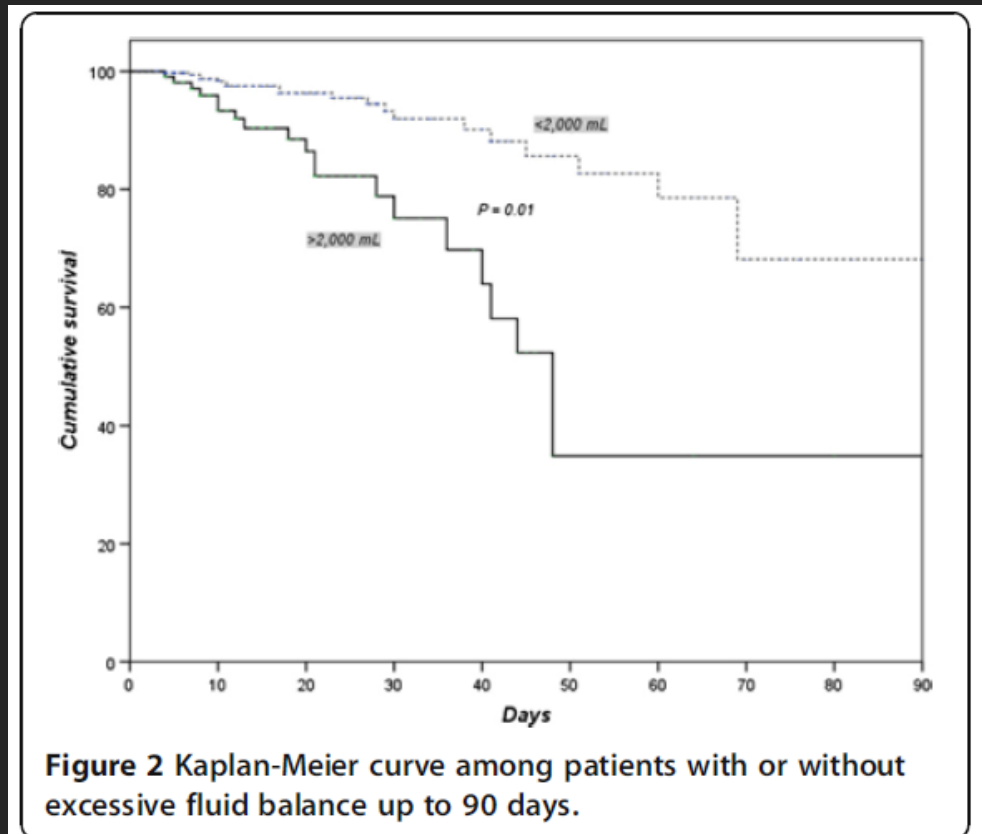
Délka hospitalizace: -0,9 dne

**Perioperační
hemodynamická
péče**

VS

BIG DATA

RIZIKO TEKUTINOVÉ TERAPIE



RESEARCH

Open Access

The effect of excess fluid balance on the mortality rate of surgical patients: a multicenter prospective study

João M Silva Jr^{1,2,4*}, Amanda Maria Ribas Rosa de Oliveira^{2,3}, Fernando Augusto Mendes Nogueira¹

Perioperative Fluid Utilization Variability and Association With Outcomes

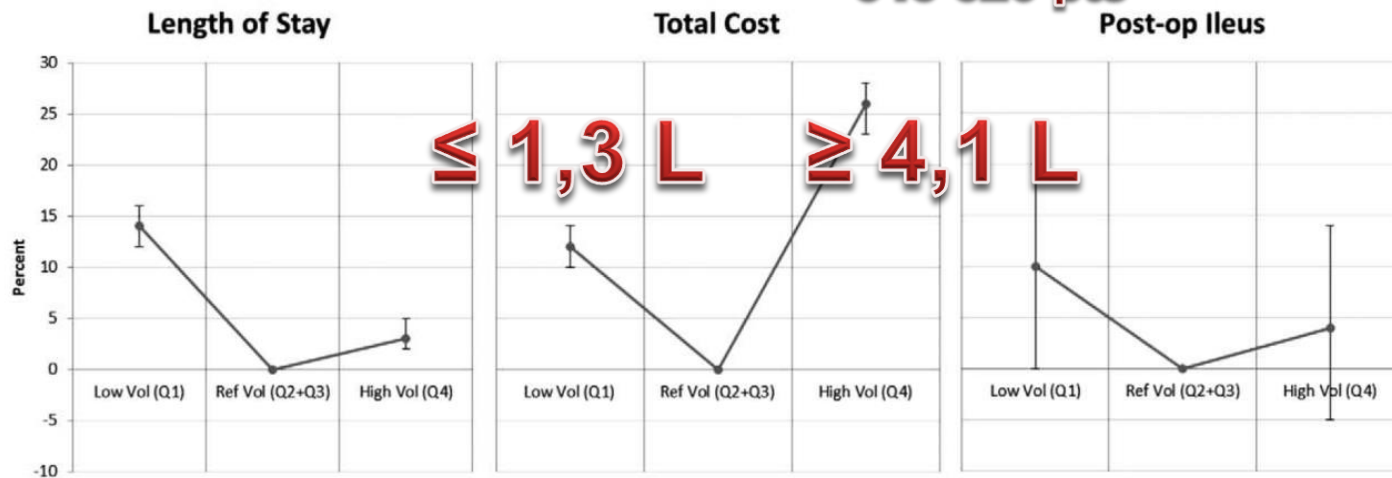
Considerations for Enhanced Recovery Efforts in Sample US Surgical Populations

Julie K. M. Thacker, MD,* William K. Mountford, PhD,† Frank R. Ernst, PharmD, MS,‡
Michelle R. Krukus, MA,‡ and Michael (Monty) G. Mythen, MBBS, MD, FRCA, FFICM, FCAI (Hon)§

Colon Surgery 84 722 pts



Hip/Knee Surgery 548 526 pts

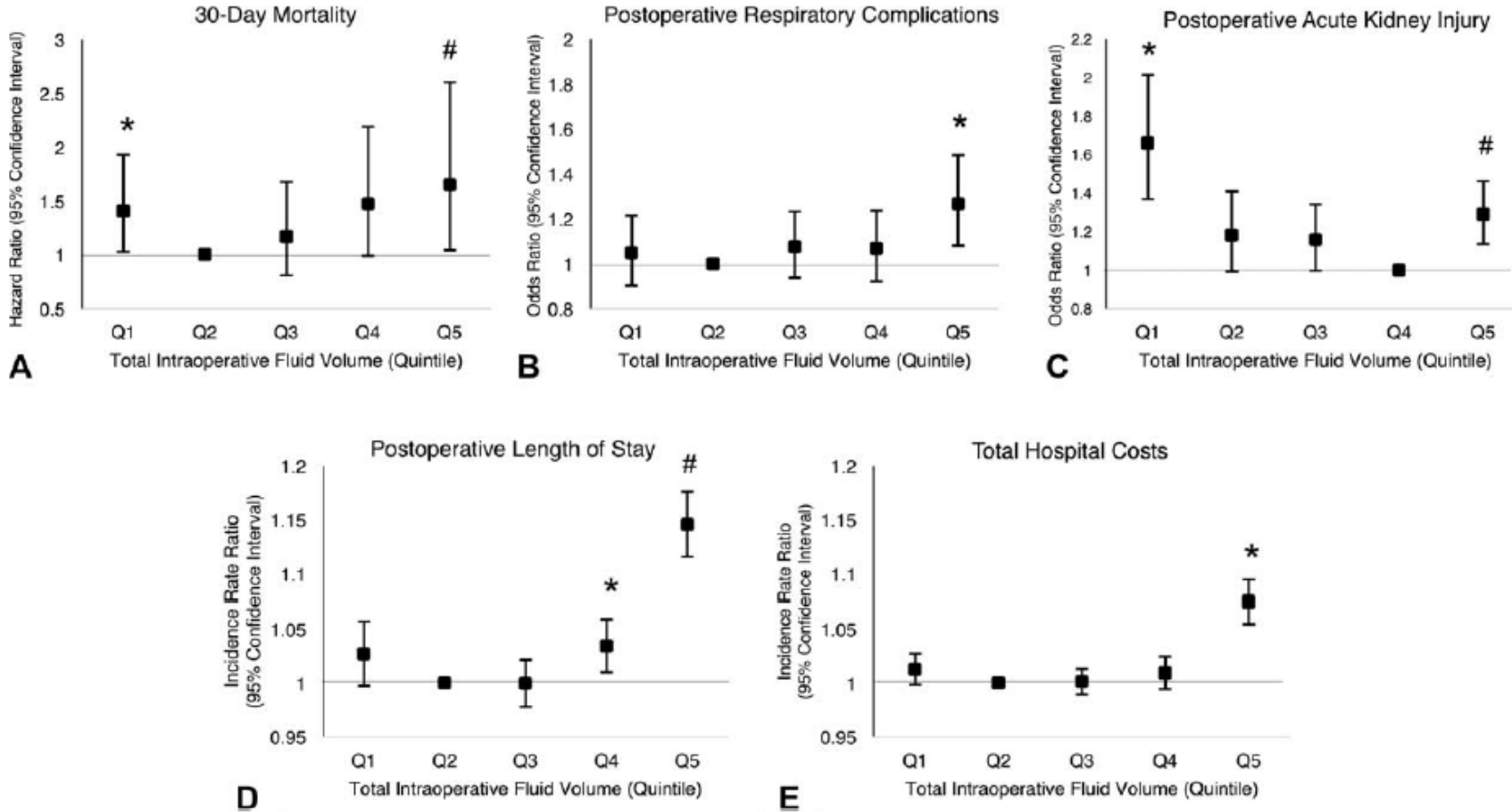


Effects of Intraoperative Fluid Management on Postoperative Outcomes

A Hospital Registry Study

92 094 pts

Christina H. Shin, MD,* Dustin R. Long, MD,* Duncan McLean, MBChB,*†
 Stephanie D. Grabitz, Cand. Med,* Karim Ladha, MD, MSc,‡ Fanny P. Timm, Cand. Med,*
 Tharusan Thevathasan, Cand. Med,* Alberto Pieretti, MD,§ Cristina Ferrone, MD,§
 Andreas Hoeft, MD, PhD,* Thomas W. L. Scheeren, MD, PhD,|| Boyd Taylor Thompson, MD,**
 Tobias Kurth, MD, ScD,††‡‡ and Matthias Eikermann, MD, PhD*



≤ 900 mL

900-1100 mL

1100-1750 mL

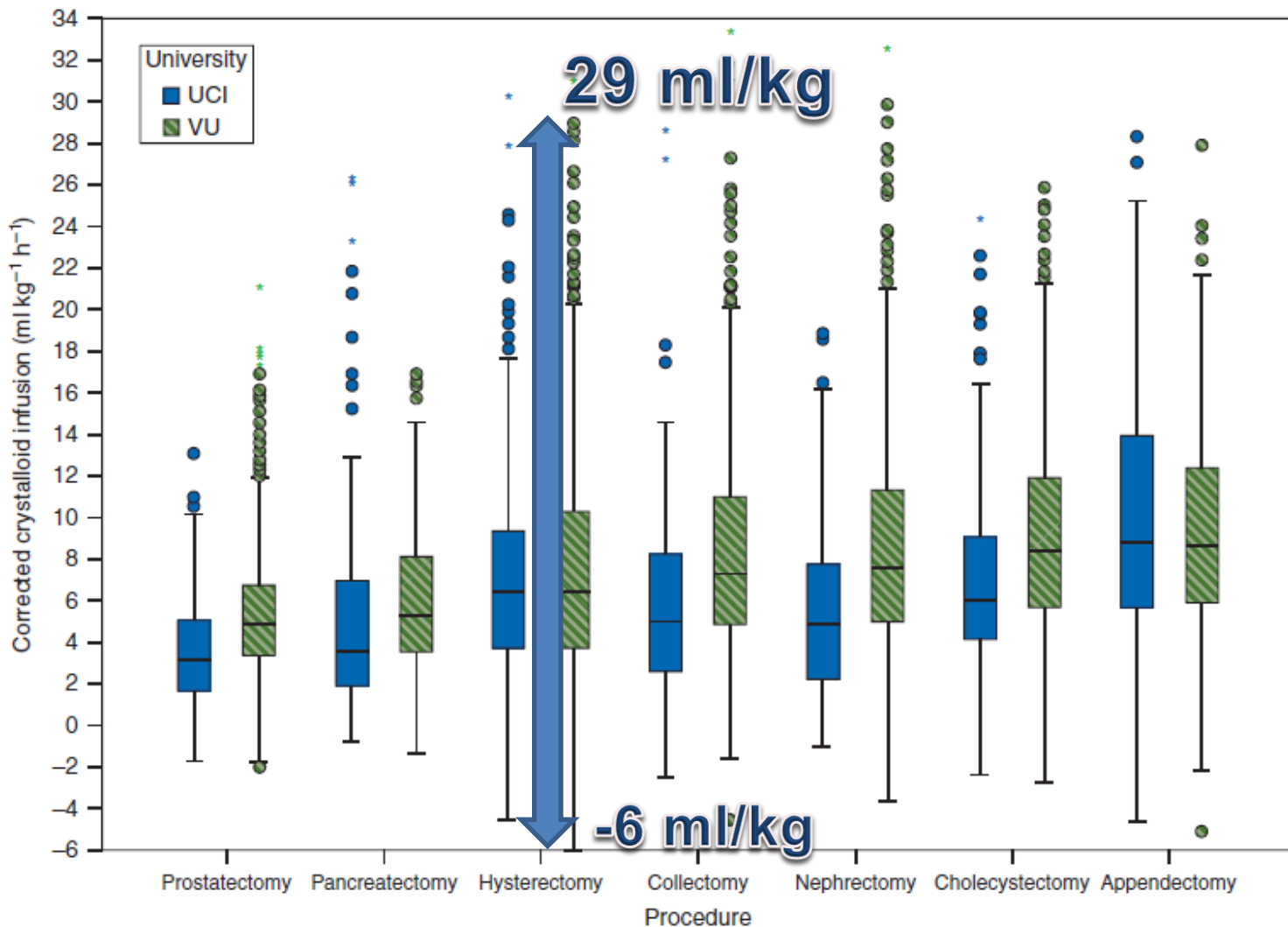
1750-2700 mL

≥ 2,7 L

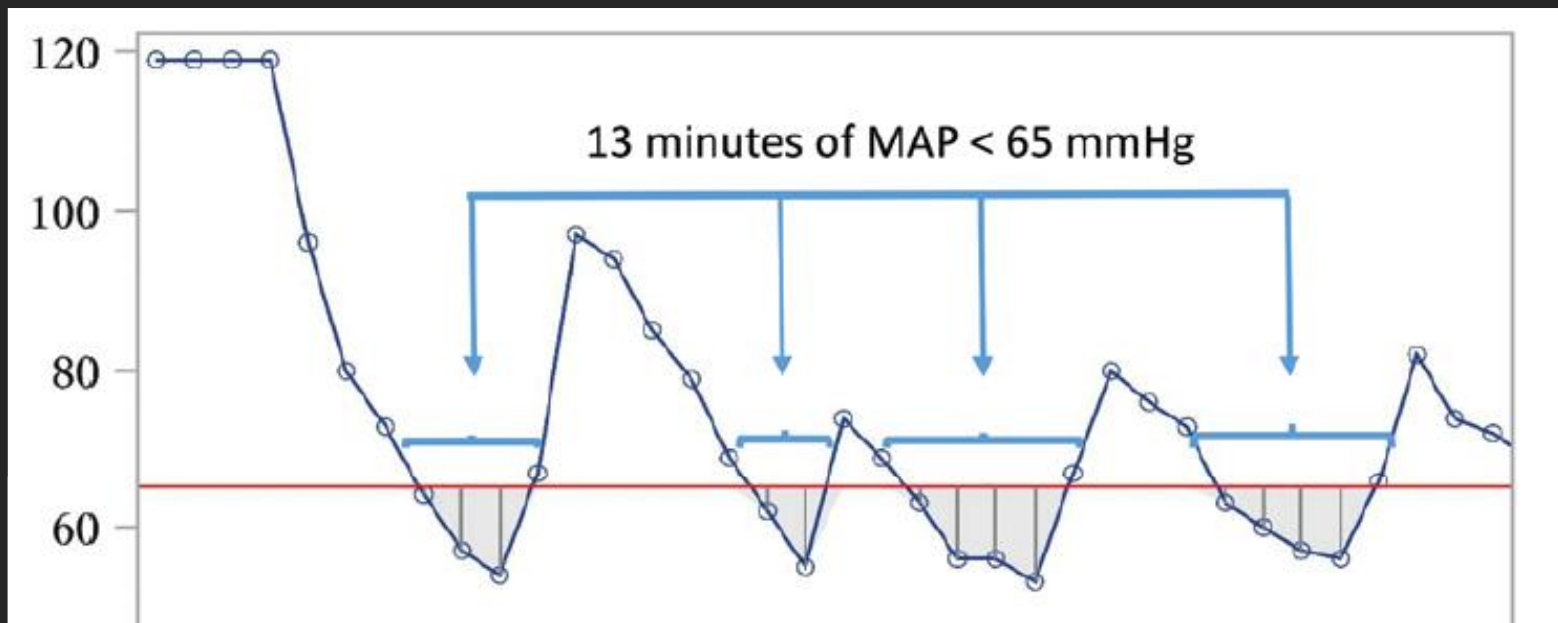
CLINICAL PRACTICE

Variability in practice and factors predictive of total crystalloid administration during abdominal surgery: retrospective two-centre analysis[†]

M. Lilot^{1,2}, J. M. Ehrenfeld³, C. Lee¹, B. Harrington¹, M. Cansson¹ and J. Rinehart^{1*}



RIZIKO HYPOTENZE ...

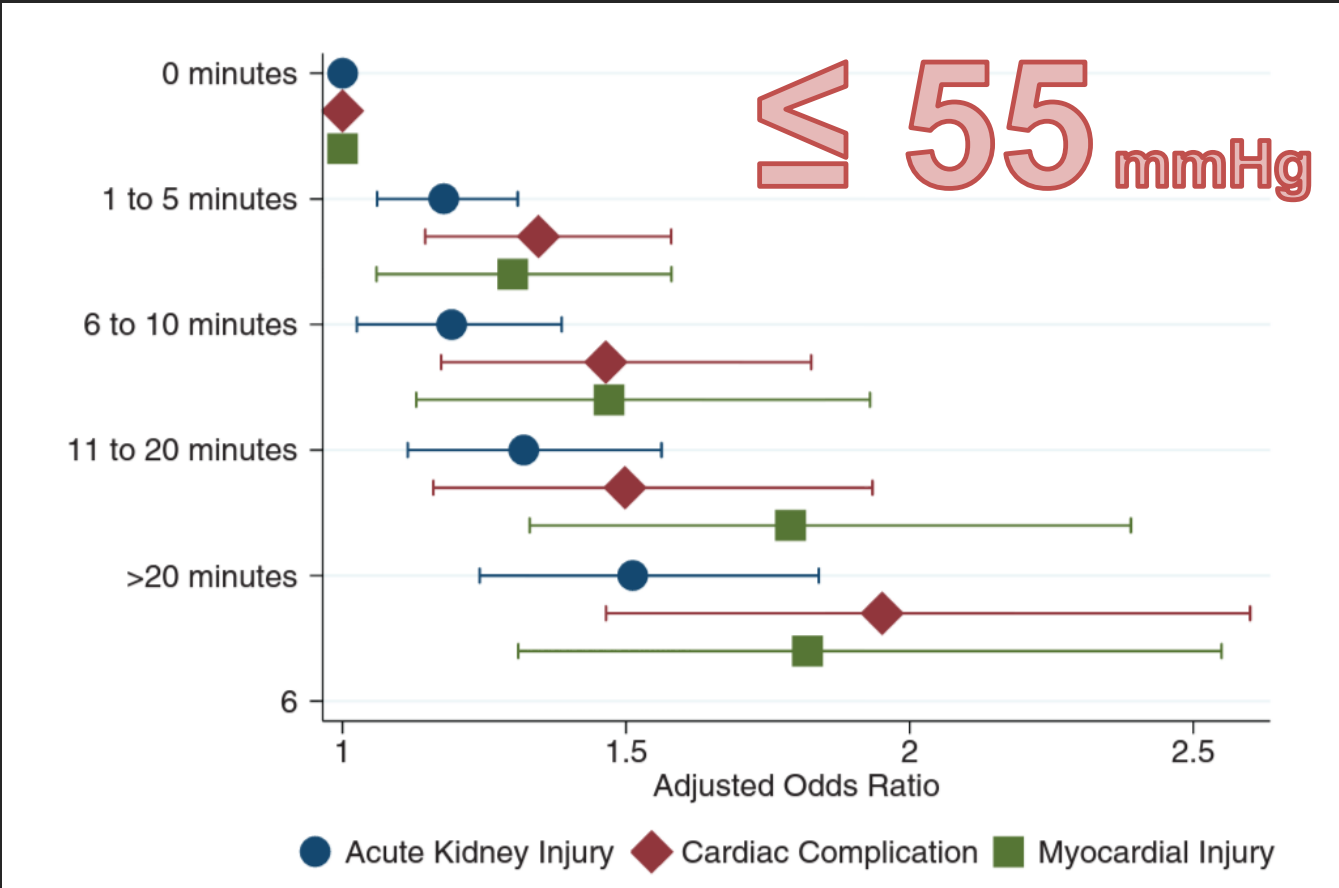


Relationship between Intraoperative Mean Arterial Pressure and Clinical Outcomes after Noncardiac Surgery

Toward an Empirical Definition of Hypotension

Michael Walsh, M.D.,* Philip J. Devereaux, M.D., Ph.D.,† Amit X. Garg, M.D., Ph.D.,‡
 Andrea Kurz, M.D.,§ Alparslan Turan, M.D.,|| Reitze N. Rodseth, M.D.,# Jacek Cywinski, M.D.,**
 Lehana Thabane, Ph.D.,†† Daniel I. Sessler, M.D.‡‡

33330 patients
 non-cardiac surgery



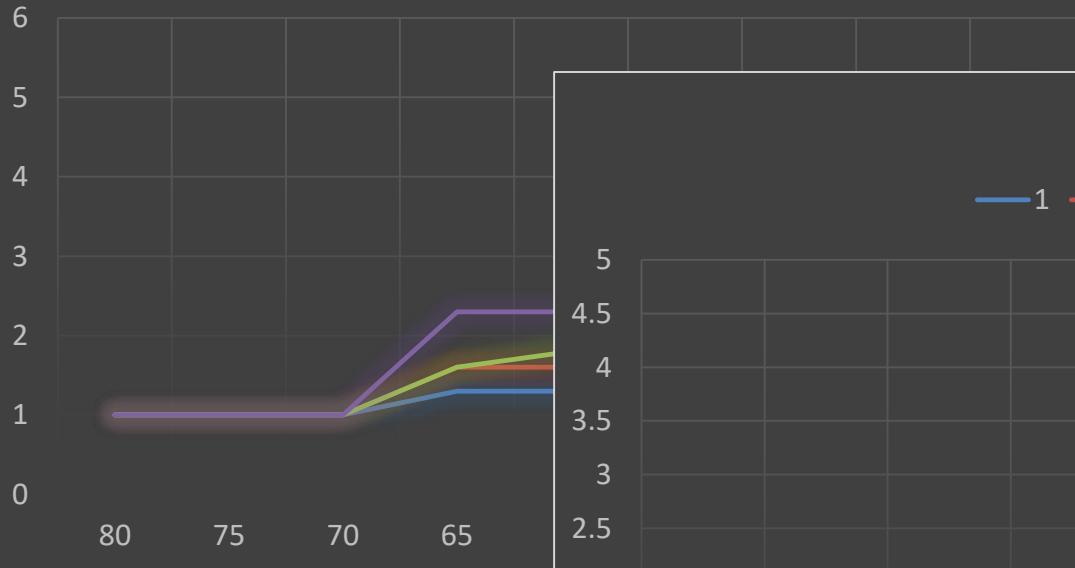
Intraoperative hypotension and the risk of postoperative adverse outcomes: a systematic review

E. M. Wesselink^{1,*}, T. H. Kappen¹, H. M. Torn¹, A. J. C. Slooter² and W. A. van Klei¹

785 806 pts
42 std

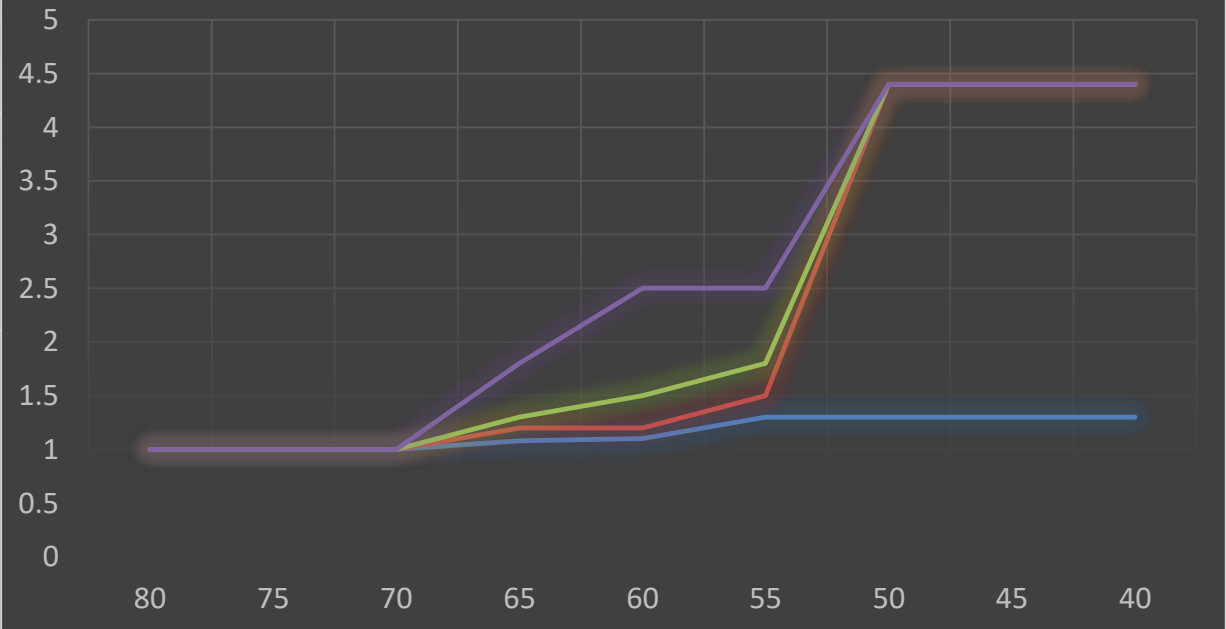
Riziko AKI

— 1 — 5 — 10 — 20



Riziko MI

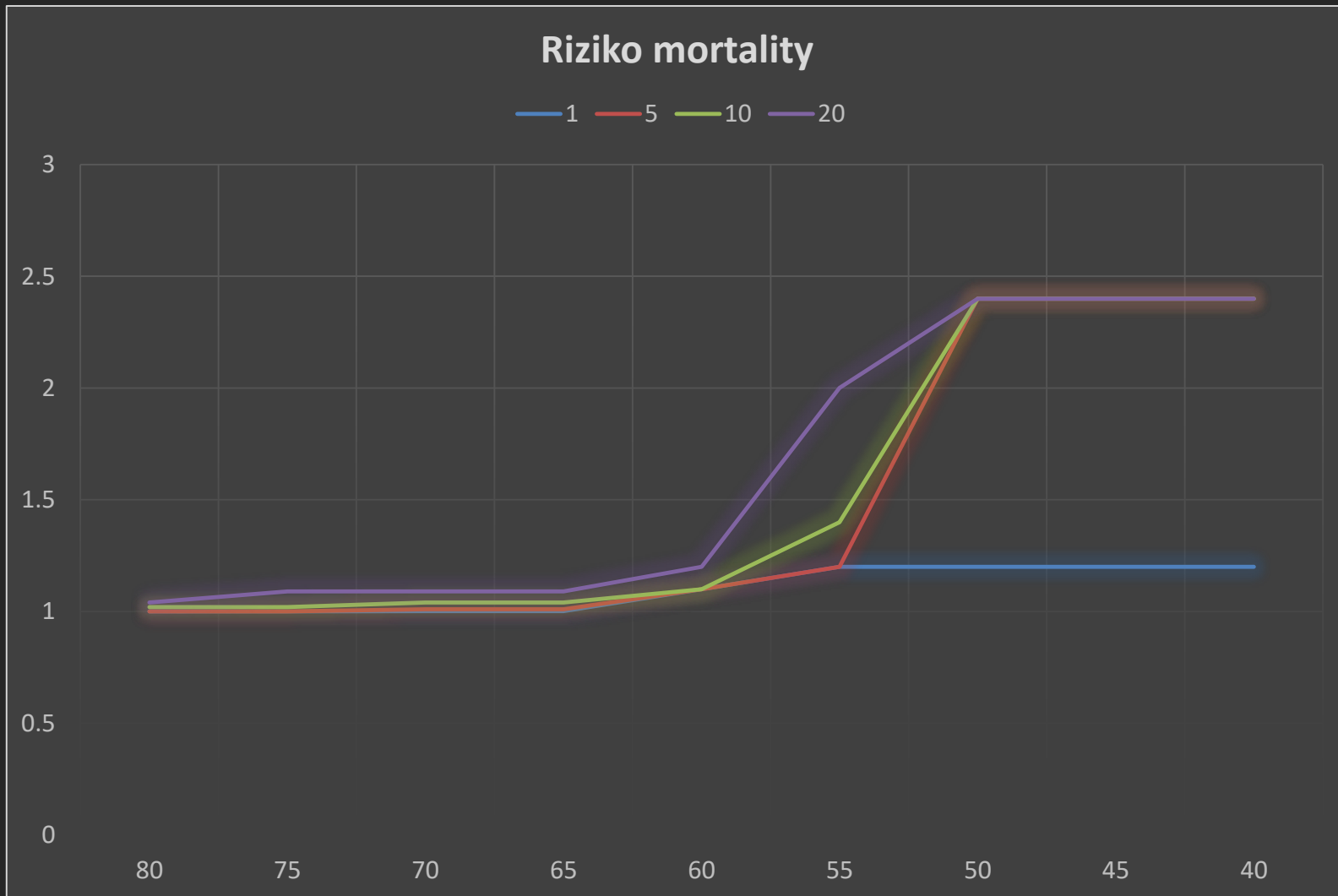
— 1 — 5 — 10 — 20



Intraoperative hypotension and the risk of postoperative adverse outcomes: a systematic review

E. M. Wesselink^{1,*}, T. H. Kappen¹, H. M. Torn¹, A. J. C. Slooter² and W. A. van Klei¹

785 806 pts
42 std



October 10, 2017

Effect of Individualized vs Standard Blood Pressure Management Strategies on Postoperative Organ Dysfunction Among High-Risk Patients Undergoing Major Surgery

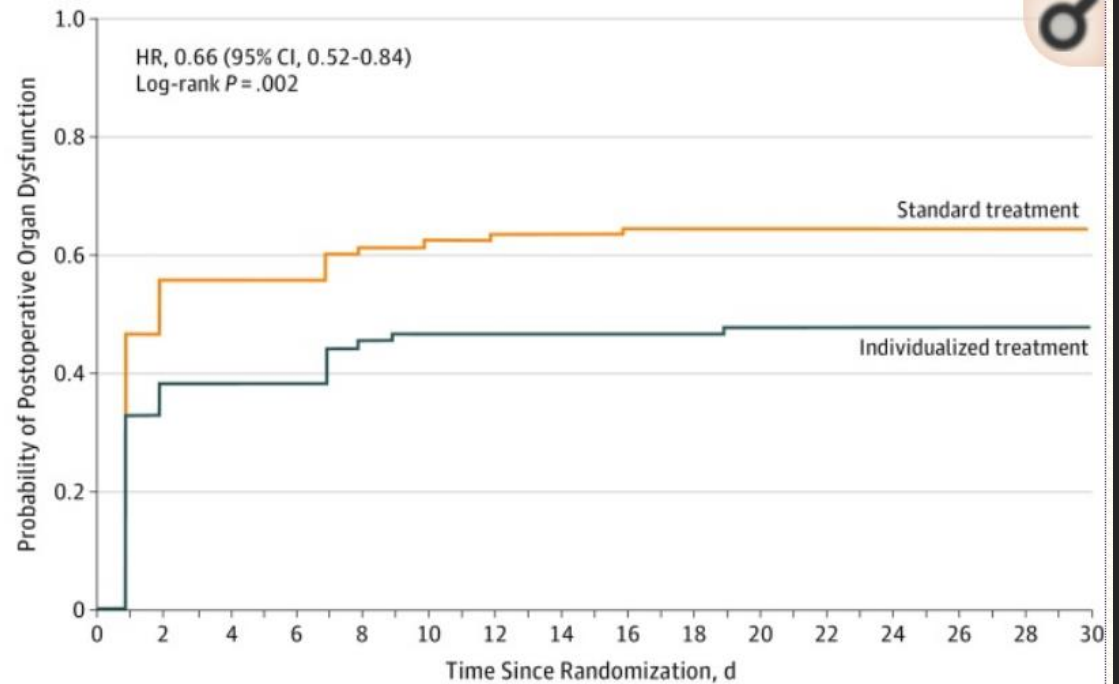
A Randomized Clinical Trial

Emmanuel Futier, MD, PhD¹; Jean-Yves Lefrant, MD, PhD²; Pierre-Gregoire Guinot, MD, PhD³; et al

» [Author Affiliations](#) | [Article Information](#)

JAMA. 2017;318(14):1346-1357. doi:10.1001/jama.2017.14172

292 pts
+/- 10% BP vs KONTROLA



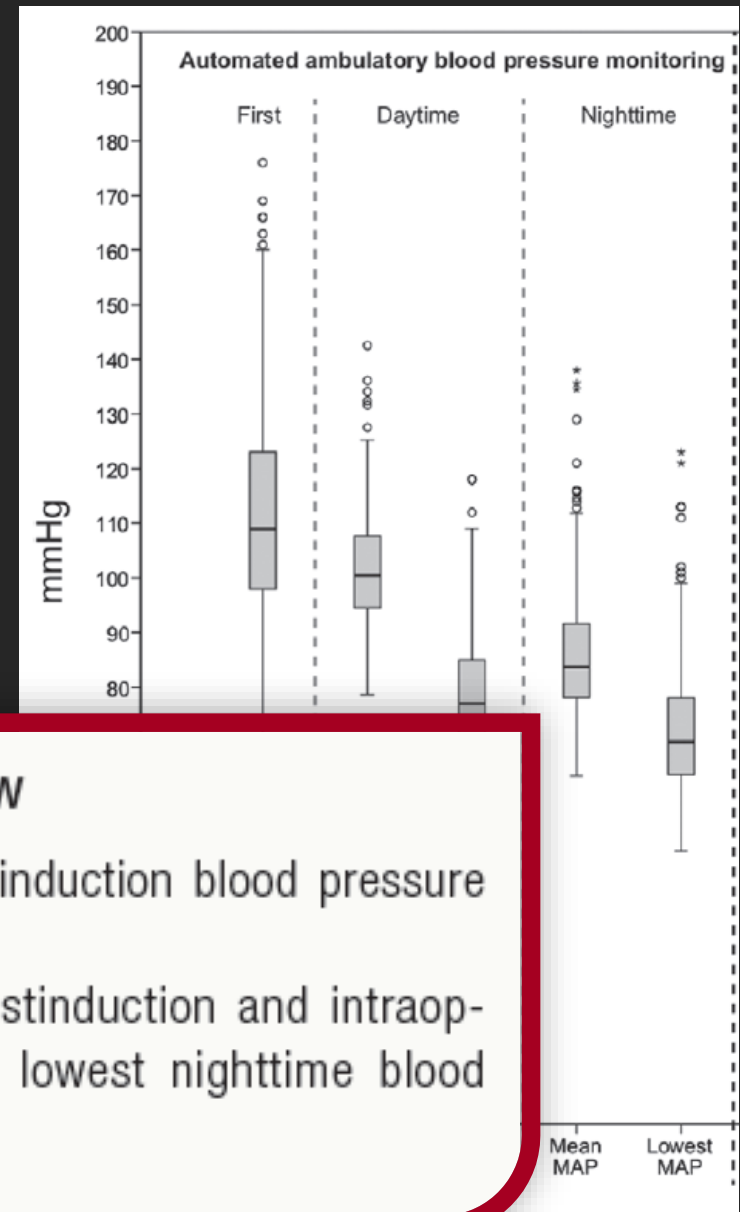
No. at risk	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Standard treatment	145	78	65		58				54							53
Individualized treatment	147	99	91		82				80							79

ANESTHESIOLOGY

Automated Ambulatory Blood Pressure Measurements and Intraoperative Hypotension in Patients Having Noncardiac Surgery with General Anesthesia

A Prospective Observational Study

Bernd Saugel, M.D., Philip C. Reese, M.D.,
Daniel I. Sessler, M.D., Christian Burfeindt,
Julia Y. Nicklas, M.D., Hans O. Pinnschmidt, Ph.D.,
Daniel A. Reuter, M.D., Stefan Südfeld, M.D.

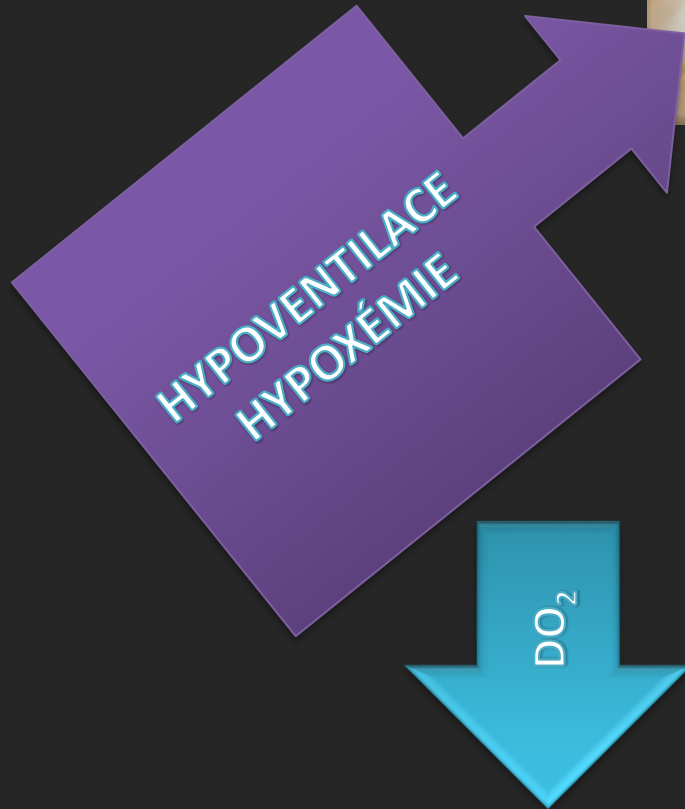


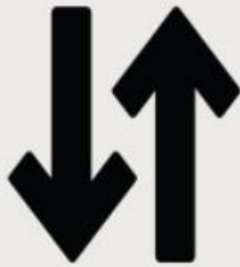
What This Article Tells Us That Is New

- There is a poor correlation between preinduction blood pressure and the usual blood pressure over 24 h
- In two thirds of patients, the lowest postinduction and intraoperative pressures were lower than the lowest nighttime blood pressure

PO OPERACI







Rates of hypotension and hypertension by continuous monitoring

MAP threshold and duration in minutes	% patients (95% CI)
Less than 70 mmHg \geq 30 min	24% (35% to 46%)
Greater than 110 mmHg \geq 30 min	42% (37% to 42%)



Routine vital-sign assessments missed

- 47% (27 of 57, 95% CI: 34% to 61%) of patients who had MAP < 65 mmHg for at least 15 min
- 98% (40 of 41; 95% CI, 87% to 99%) of patients with MAP > 130 mmHg for at least 30 min

Postoperative hypotension and hypertension were common, prolonged, profound, and largely undetected by routine vital-sign assessments in a cohort of adults recovering from abdominal surgery.

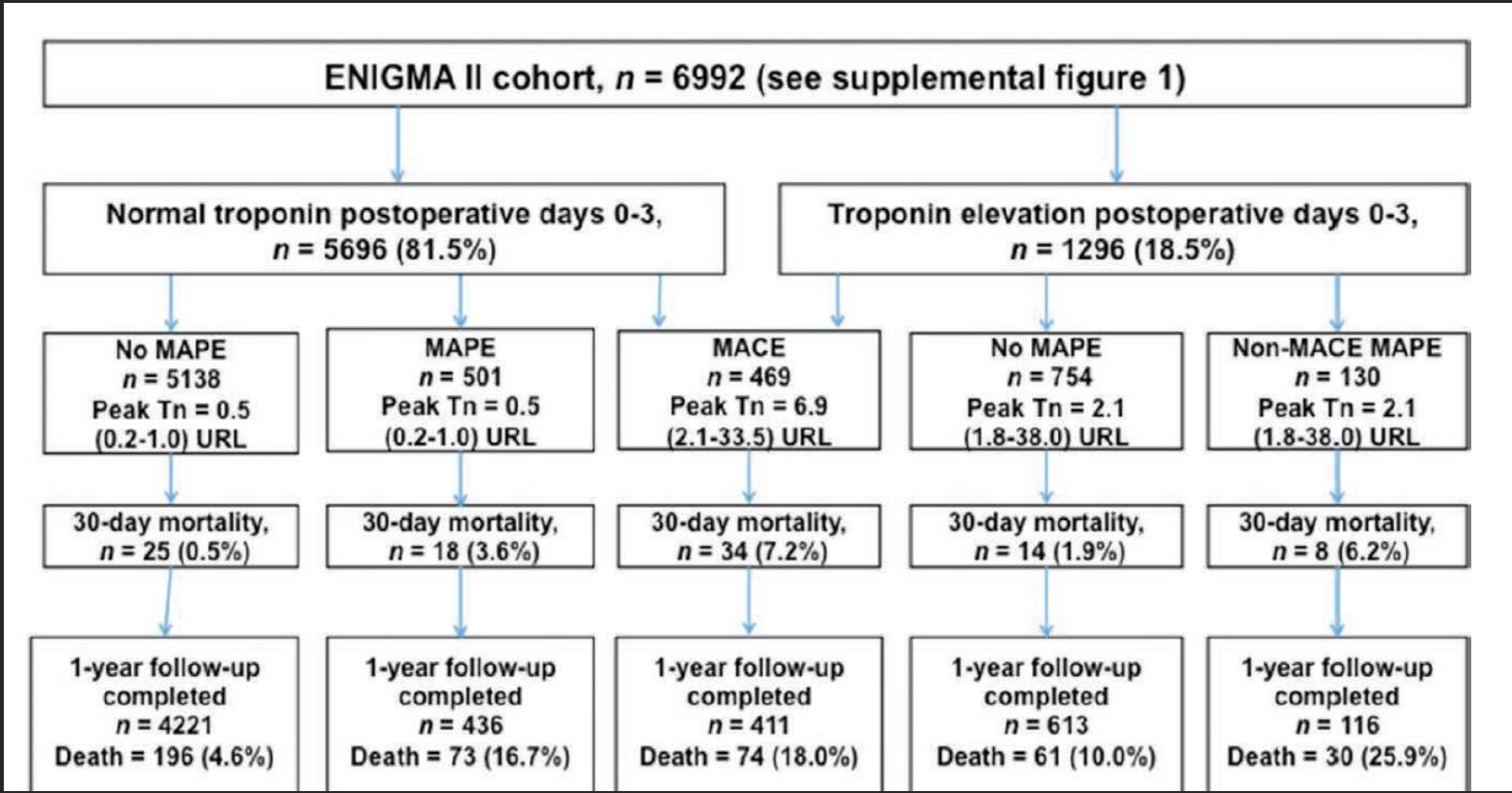
Turan, *et al.* ANESTHESIOLOGY. April 2019.

ANESTHESIOLOGY

Trusted Evidence: Discovery to Practice

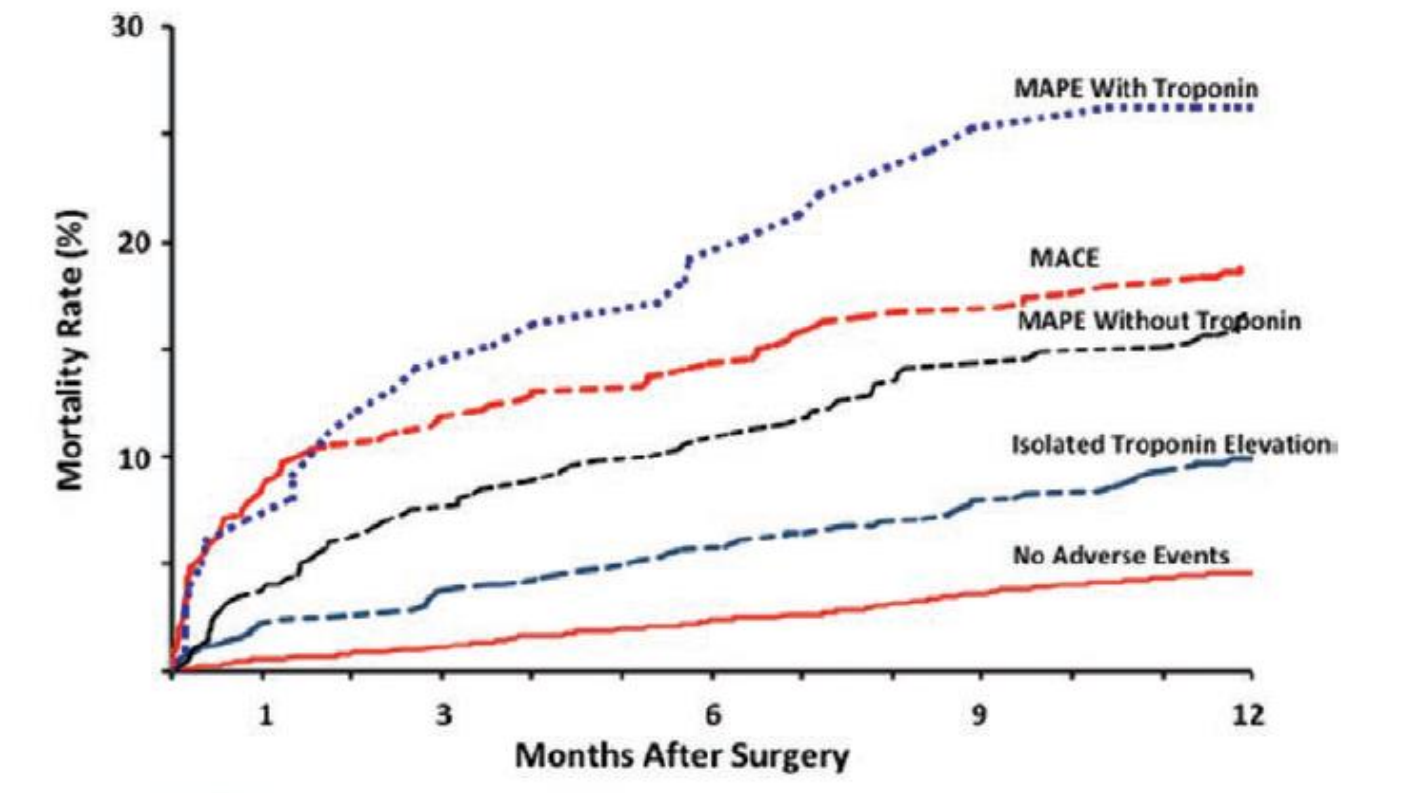
Implication of Major Adverse Postoperative Events and Myocardial Injury on Disability and Survival: A Planned Subanalysis of the ENIGMA-II Trial

W. Scott Beattie, MD, PhD, FRCPC,*†‡ Duminda N. Wijeyesundera, MD, PhD, FRCPC,†§||
 Matthew T. V. Chan, MBBS, PhD, FANZCA, FHKCA, FHKAM,¶
 Philip J. Peyton, MBBS, MD, PhD, FANZCA,##**
 Kate Leslie, MBBS, MD, MEpid, MHlthServMt, FANZCA, FAHMS,††‡‡§§|||
 Michael J. Paech, MBBS, DM, DRCOG, FRCA, FANZCA, FFPANZCA, FRANZCOG (Hons),¶¶||##
 Daniel I. Sessler, MD,*** Sophie Wallace, MPH,|||††† and
 Paul S. Myles, MBBS, MD, MPH, DSc, FANZCA, FCAI, FRCA, FAHMS,|||†††‡‡‡
 on behalf of the ANZCA Clinical Trials Network for the ENIGMA-II Investigators



Implication of Major Adverse Postoperative Events and Myocardial Injury on Disability and Survival: A Planned Subanalysis of the ENIGMA-II Trial

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Kate Leslie, MBBS, MD, MEpid, MHlthServMt, FANZCA, FAHMS,††‡‡§§|||
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on behalf of the ANZCA Clinical Trials Network for the ENIGMA-II Investigators



OPERACE JE JAKO ZÁTĚŽOVÝ TEST ...

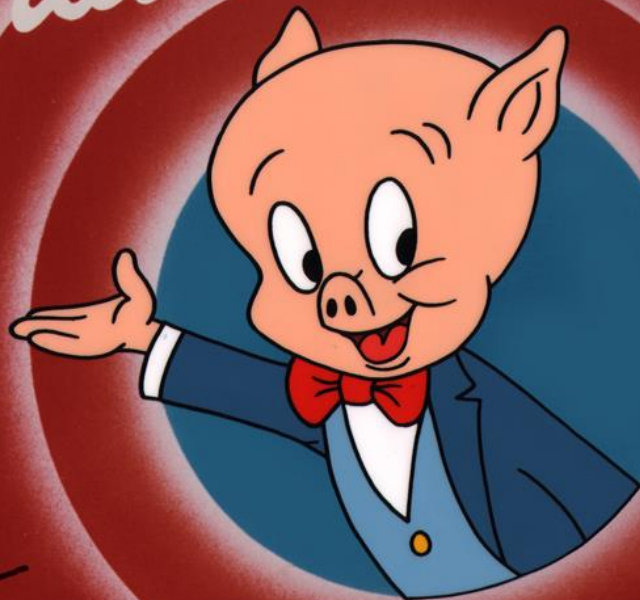
**A PROJEV OBĚHOVÉ NESTABILITY JE
PRAVDĚPODOBNĚ ZNÁMKOU
SELHÁNÍ V TESTU REZERV...**

HEMODYNAMICKÁ OPTIMALIZACE JE
JENOM KOUSEK SKLÁDAČKY...





That's all Folks™



Felix
Freedle

2.05
500

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Jaký je váš reakční čas, když dojde ke vzniku oběhové nestability (hypotenze/bradykardie atd.)??

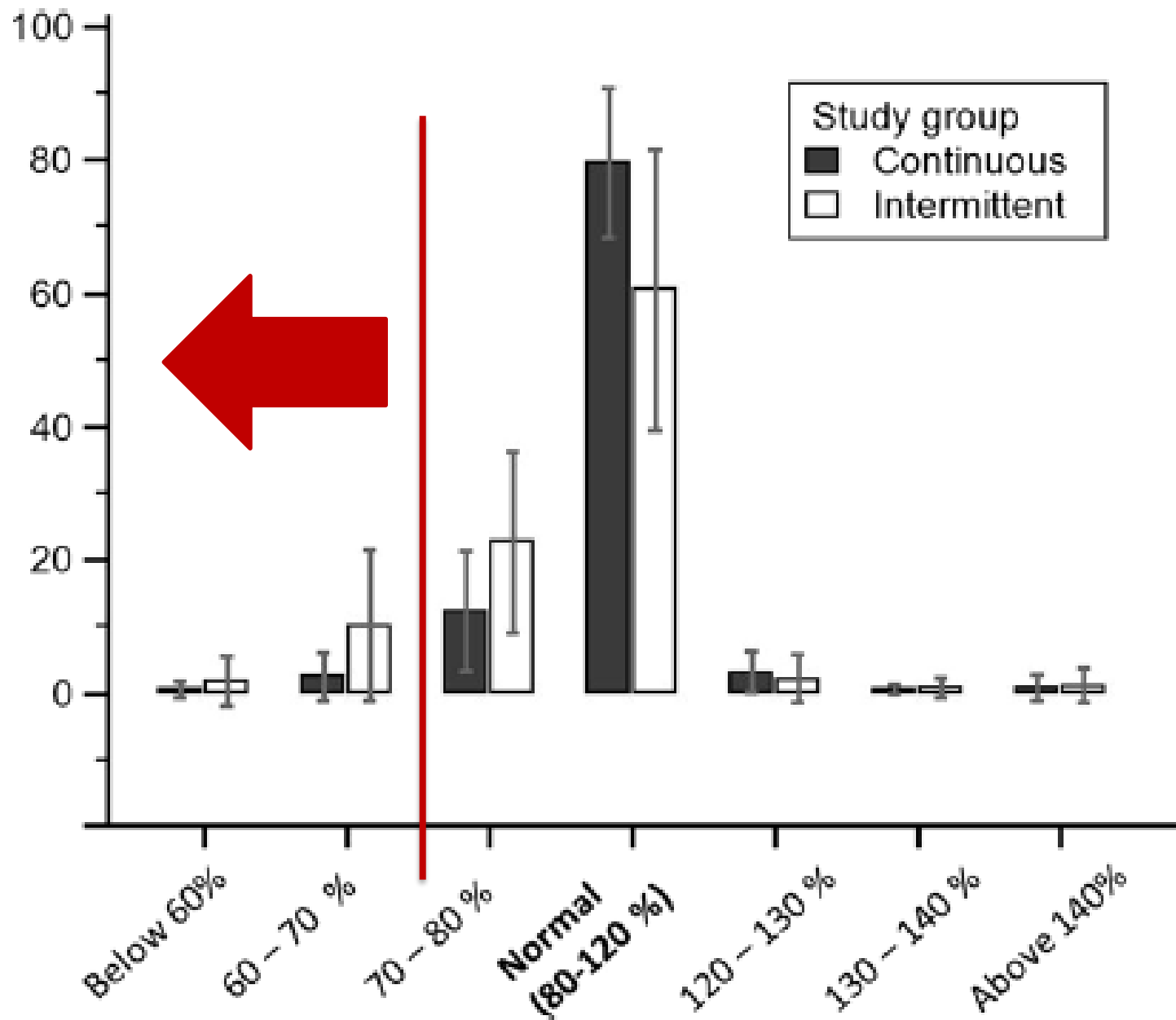


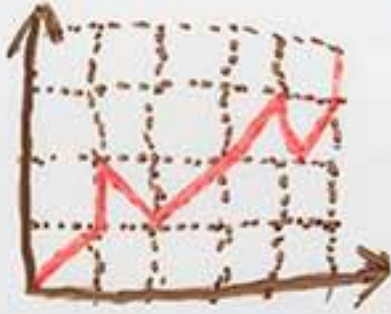
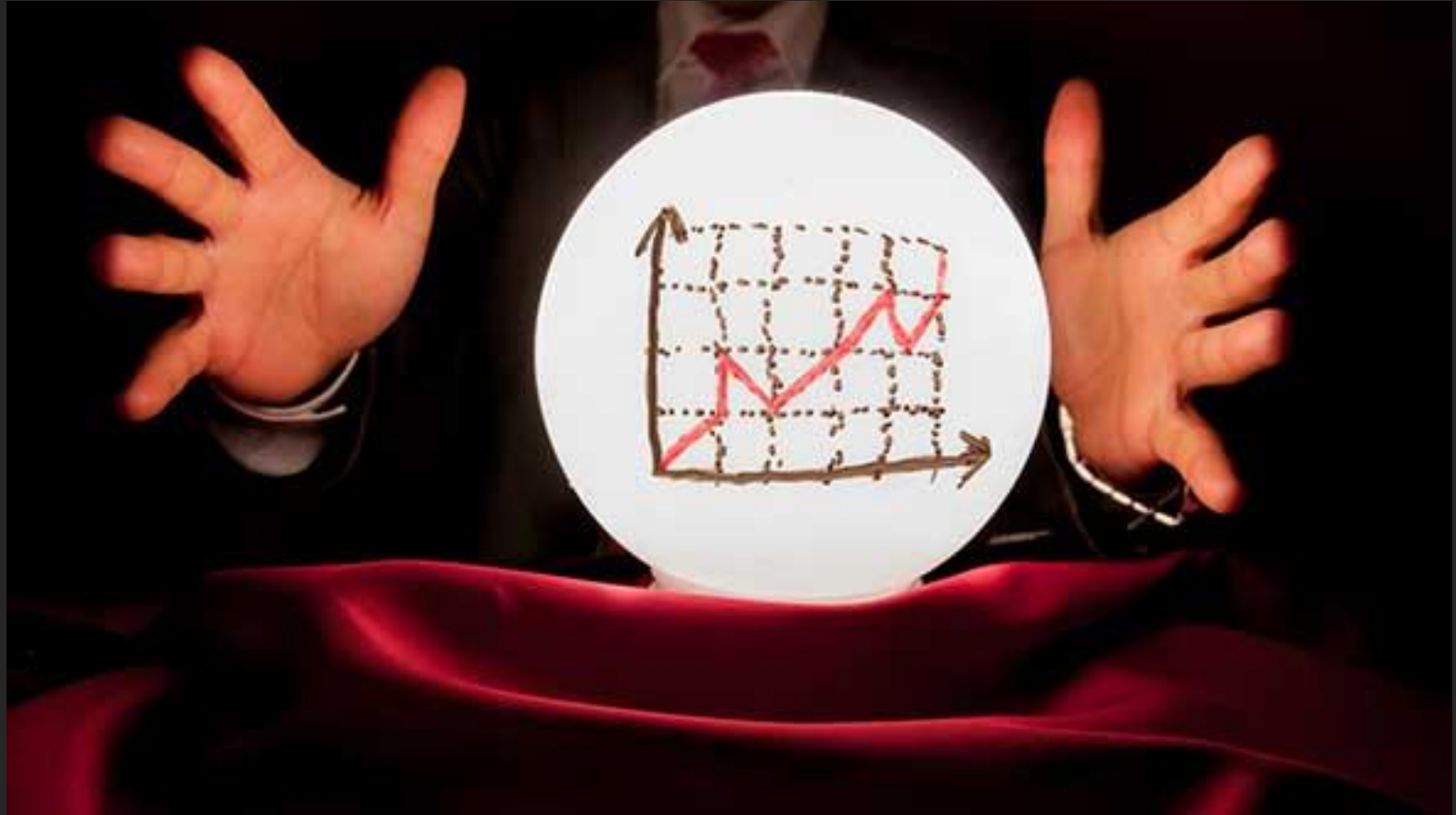
Continuous non-invasive monitoring improves blood pressure stability in upright position: randomized controlled trial

Jan Benes · Alena Simanova · Tereza Tovarnicka ·
Silvie Sevcikova · Jakub Kletecka · Jan Zatloukal ·
Richard Pradl · Ivan Chytra · Eduard Kasal

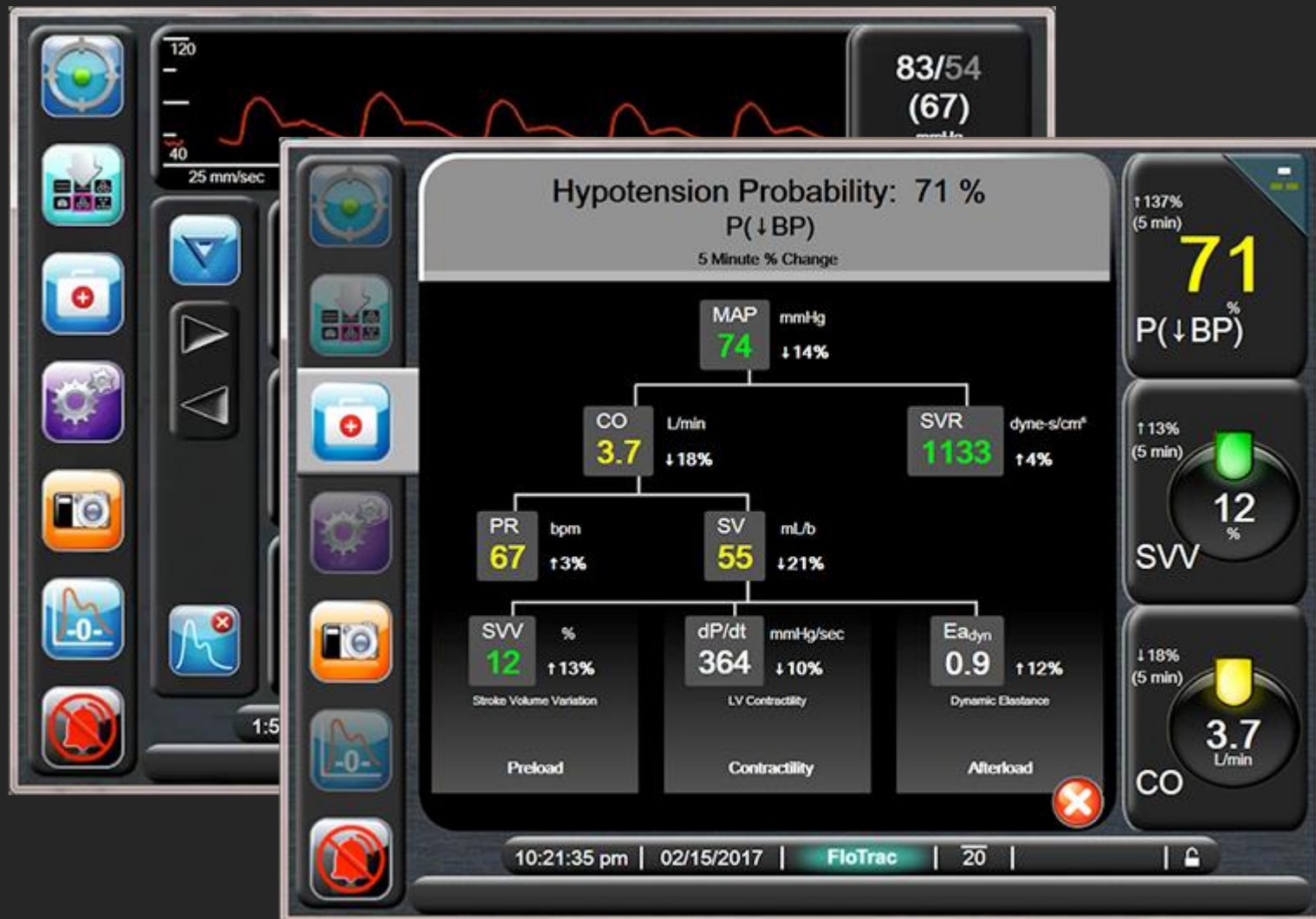


Absolute time (min)	12 [4–20]	27 [16–34]	0.001
Proportional time (%)	14 [7–20] %	33.5 [17.5–53] %	0.003
Number of episodes per patient	2.5 [1.5–4]	3.5 [3–5.5]	0.053
Duration of episode (min)	4 [2–7]	8 [6–16]	0.014
Number of interventions	2 [1–3]	2 [1–4]	0.913





PŘEDPOVÍDAT HYPOTENZI??

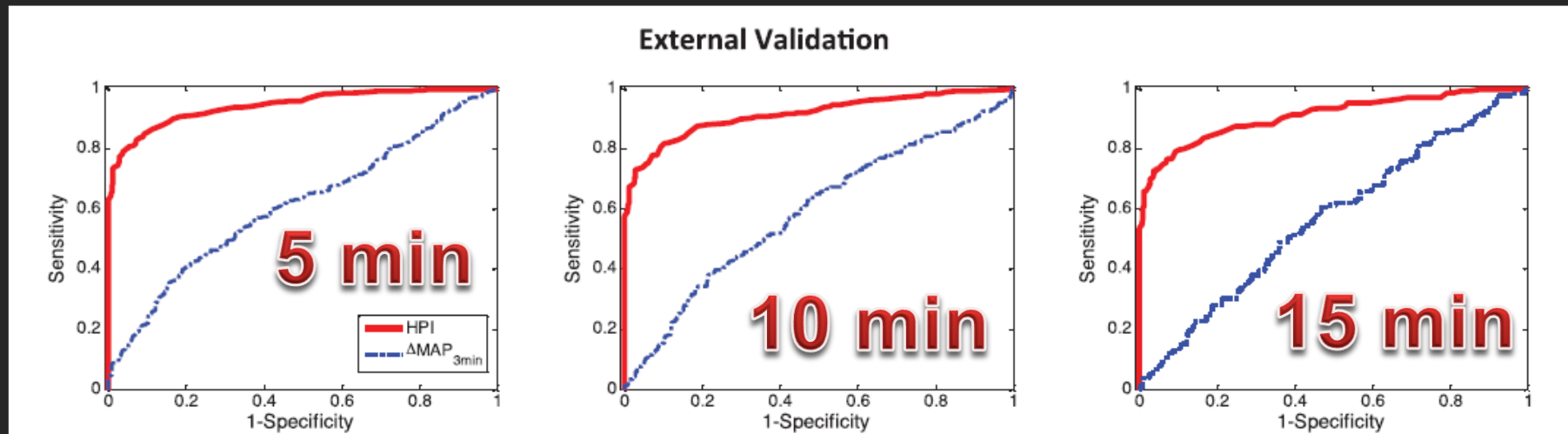


Machine-learning Algorithm to Predict Hypotension Based on High-fidelity Arterial Pressure Waveform Analysis

Feras Hatib, Ph.D., Zhongping Jian, Ph.D., Sai Buddi, Ph.D., Christine Lee, M.S., Jos Settels, M.S., Karen Sibert, M.D., F.A.S.A., Joseph Rinehart, M.D., Maxime Cannesson, M.D., Ph.D.

What This Article Tells Us That Is New

- A machine-learning algorithm based on thousands of arterial waveform features can identify an intraoperative hypotensive event 15 min before its occurrence with a sensitivity of 88% and specificity of 87%



Machine-learning Algorithm to Predict Hypotension Based on High-fidelity Arterial Pressure Waveform Analysis

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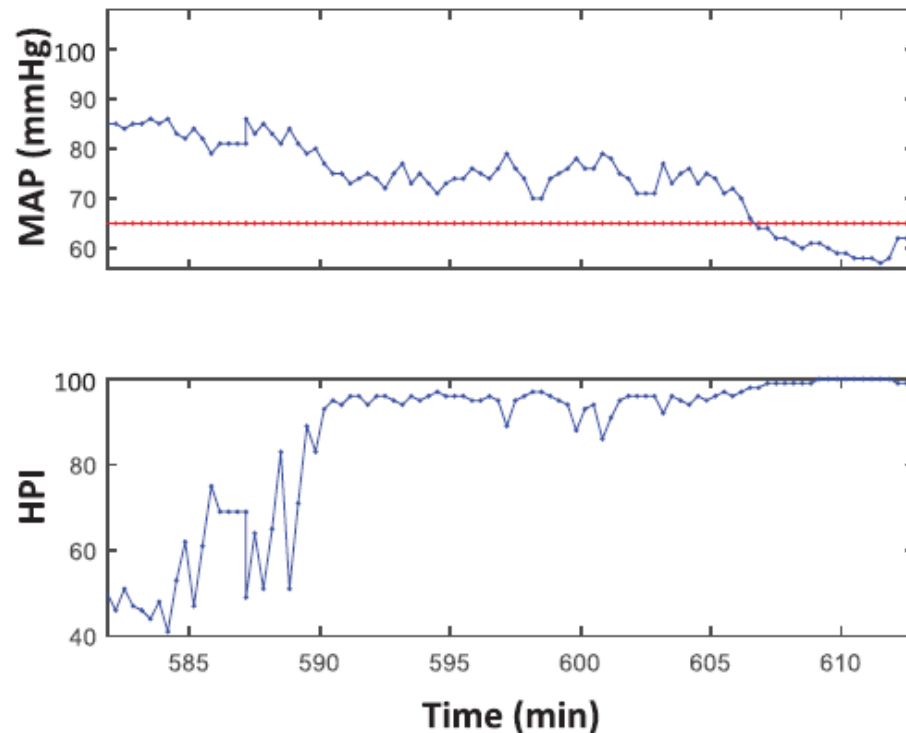


Fig. 5. One illustrative patient record showing the association between the algorithm output (Hypotension Prediction Index [HPI]) and the evolution of mean arterial pressure (MAP) over time.

20
HPI+

vs

20
ctrl

50%*

80%

36 sec

74 sec

3 min

7 min

0,4 mmHg.min

17,5 mmHg.min





HEMODYNAMICKÁ OPTIMALIZACE JE
JENOM KOUSEK SKLÁDAČKY...

